

WHAT IS CLAIMED IS:

1001714-102401

1. A semiconductor device including a thin film transistor comprising:
a semiconductor film formed on an insulating surface;
an insulating film on the semiconductor film;
5 a gate electrode on the insulating film;
said the semiconductor film including:
a channel forming region overlapped with the gate electrode;
an impurity region in contact with the channel forming region,
wherein the impurity region has a concentration distribution in which an
10 impurity concentration is increased with distance from the channel forming
region.

2. A semiconductor device including a thin film transistor comprising:
a semiconductor film on an insulating surface;
an insulating film on the semiconductor film;
15 a gate electrode on the insulating film;
said semiconductor film including:
a channel forming region overlapped with the gate electrode;
an offset region in contact with the channel forming region;
an impurity region in contact with the offset region,
20 wherein the impurity region has a concentration distribution in which an
impurity concentration is increased with distance from the channel forming
region.

3. A device according to claim 1,

wherein the impurity region has the concentration distribution in which the impurity concentration is continuously increased with distance from the channel forming region.

4. A device according to claim 1,

5 wherein the impurity region has a concentration distribution in which an impurity concentration is increased with distance from the channel forming region in a channel length direction.

5. A device according to claim 1,

wherein the thin film transistor is an n-channel thin film transistor.

10 6. A semiconductor device comprising:

a pixel portion and a driving circuit on an insulating surface;

an n-channel thin film transistor and a p-channel thin film transistor in the driving circuit;

15 a pixel thin film transistor including a semiconductor film in the pixel portion; said semiconductor film including a channel forming region and an impurity region;

a pixel electrode connected to the pixel thin film transistor in the pixel portion,

20 wherein the impurity region has a concentration distribution in which an impurity concentration is increased with distance from the channel forming region.

7. A device according to claim 6, further comprising:

a gate electrode in the n-channel thin film transistor, said gate electrode having a taper portion;

an impurity region in the n-channel thin film transistor,

wherein the taper portion is overlapped with the impurity region with an
5 insulating film interposed therebetween.

8. A device according to claim 6, further comprising:

an offset region between the channel forming region and the impurity region in the pixel thin film transistor.

9. A device according to claim 6, further comprising:

10 a gate electrode in the pixel thin film transistor,
wherein the gate electrode is not overlapped with the channel forming region with an insulating film interposed therebetween in the pixel thin film transistor.

10. A device according to claim 1,

15 wherein the gate electrode includes a first conductive layer and a second conductive layer on the first conductive layer.

11. A device according to claim 1,

wherein the impurity region includes one of a source region and a drain region.

20 12. A device according to claim 1,

wherein the concentration distribution is an exponential distribution.

13. A device according to claim 1,

wherein the concentration distribution is a normal distribution.

14. A device according to claim 1,

wherein the concentration distribution is a linear distribution with a

5 tilt.

15. A device according to claim 1,

wherein the impurity concentration is a concentration of an impurity to impart an one conductivity type to the semiconductor film.

16. A device according to claim 1,

10 wherein the semiconductor device is a liquid crystal module.

17. A device according to claim 1,

wherein the semiconductor device is an EL module.

18. A device according to claim 1,

15 wherein the impurity region is formed on both sides of the channel forming region.

19. A device according to claim 1,

wherein a thickness of the insulating film is different between a first region at a largest distance from the channel forming region and a second region at a smallest distance therefrom.

20. A device according to claim 1,

wherein the impurity region includes a first portion and a second portion,

wherein the impurity concentration is increased in the first portion while
5 the impurity concentration is constant in the second portion,

wherein the first portion has a length in a range of 1 μm or more in a channel length direction.

21. A device according to claim 1,

wherein the semiconductor device is one selected from the group
10 consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer and a portable information terminal.

22. A method of manufacturing a semiconductor device, said method comprising the steps of:

forming a semiconductor film on an insulating surface;
15 forming an insulating film on the semiconductor film;
forming a conductive film having a taper portion on the insulating film;

adding an impurity element imparting one conductivity type to the semiconductor film through the taper portion and the insulating film to form an
20 impurity region;

selectively removing only a taper portion of the conductive film to form a gate electrode,

wherein an impurity concentration is increased toward an end portion of the taper portion in the impurity region.

23. A method of manufacturing a semiconductor device, said method comprising the steps of:

forming a semiconductor film on an insulating surface;

forming an insulating film on the semiconductor film;

5 forming a gate electrode on the insulating film;

etching the insulating film to form an impurity layer with a taper portion on the semiconductor film;

adding an impurity element imparting one conductivity type to the semiconductor film through the taper portion and the insulating film to form an
10 impurity region;

selectively removing only a taper portion of the conductive film to form a gate electrode,

wherein an impurity concentration is increased toward an end portion of the taper portion in the impurity region.

15 24. A device according to claim 2,

wherein the impurity region has the concentration distribution in which the impurity concentration is continuously increased with distance from the channel forming region.

25. A device according to claim 2,

20 wherein the impurity region has a concentration distribution in which an impurity concentration is increased with distance from the channel forming region in a channel length direction.

26. A device according to claim 2,

wherein the thin film transistor is an n-channel thin film transistor.

27. A device according to claim 2,

wherein the gate electrode includes a first conductive layer and a second conductive layer on the first conductive layer.

5 28. A device according to claim 2,

wherein the impurity region includes one of a source region and a drain region.

29. A device according to claim 2,

wherein the concentration distribution is an exponential distribution.

10 30. A device according to claim 2,

wherein the concentration distribution is a normal distribution.

31. A device according to claim 2,

wherein the concentration distribution is a linear distribution with a tilt.

15 32. A device according to claim 2,

wherein the impurity concentration is a concentration of an impurity to impart an one conductivity type to the semiconductor film.

33. A device according to claim 2,

wherein the semiconductor device is a liquid crystal module.

34. A device according to claim 2,

wherein the semiconductor device is an EL module.

35. A device according to claim 2,

wherein the impurity region is formed on both sides of the channel
5 forming region.

36. A device according to claim 2,

wherein a thickness of the insulating film is different between a first
region at a largest distance from the channel forming region and a second region at
a smallest distance therefrom.

10 37. A device according to claim 2,

wherein the impurity region includes a first portion and a second
portion,

wherein the impurity concentration is increased in the first portion while
the impurity concentration is constant in the second portion,

15 wherein the first portion has a length in a range of 1 μm or more in a
channel length direction.

38. A device according to claim 2,

wherein the semiconductor device is one selected from the group
consisting of a video camera, a digital camera, a projector, a goggle type display, a
20 car navigation system, a personal computer and a portable information terminal.

39. A device according to claim 6, further comprising:

a gate electrode in the pixel thin film transistor,
wherein the gate electrode includes a first conductive layer and a second
conductive layer on the first conductive layer.

40. A device according to claim 6,
5 wherein the impurity region includes one of a source region and a drain
region.

41. A device according to claim 6,
wherein the concentration distribution is an exponential distribution.

42. A device according to claim 6,
10 wherein the concentration distribution is a normal distribution.

43. A device according to claim 6,
wherein the concentration distribution is a linear distribution with a
tilt.

44. A device according to claim 6,
15 wherein the impurity concentration is a concentration of an impurity to
impart an one conductivity type to the semiconductor film.

45. A device according to claim 6,
wherein the semiconductor device is a liquid crystal module.

46. A device according to claim 6,

wherein the semiconductor device is an EL module.

47. A device according to claim 6,

wherein the impurity region is formed on both sides of the channel forming region.

5 48. A device according to claim 6, further comprising:

an insulating film on the semiconductor film in the pixel thin film transistor,

wherein a thickness of the insulating film is different between a first region at a largest distance from the channel forming region and a second region at
10 a smallest distance therefrom.

49. A device according to claim 6,

wherein the impurity region includes a first portion and a second portion,

wherein the impurity concentration is increased in the first portion while
15 the impurity concentration is constant in the second portion,

wherein the first portion has a length in a range of 1 μm or more in a channel length direction.

50. A device according to claim 6,

wherein the semiconductor device is one selected from the group
20 consisting of a video camera, a digital camera, a projector, a goggle type display, a car navigation system, a personal computer and a portable information terminal.